

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

1. (currently amended) An oxygen-resistant iron hydrogenase derived from a ~~green algae~~ *Chlamydomonas reinhardtii* oxygen-sensitive iron hydrogenase by substitution of one or more identified amino acid residues within a hydrogen channel of the oxygen-sensitive iron hydrogenase, wherein the one or more identified amino acid residues are independently substituted with a naturally occurring or synthetic amino acid selected from the group consisting of tryptophan, isoleucine, leucine, phenylalanine, and derivatives thereof, having properties that limit O₂ diffusion through the channel while allowing H₂ diffusion out of the channel, and wherein the substituted amino acid reduces the diameter of the channel.
- 2-29. (cancelled)
30. (currently amended) The oxygen-resistant iron hydrogenase of claim 1 [[29]], wherein the one or more residues within the hydrogen channel of the oxygen-sensitive iron hydrogenase are independently substituted with at least one bulky residue that projects close to a catalytic site having a bimetallic center containing two iron atoms.
31. (currently amended) The oxygen-resistant iron hydrogenase of claim 1 [[29]], wherein the one or more residues within the hydrogen channel of the oxygen-sensitive iron hydrogenase are independently substituted with at least one bulky residue that partially shields an Fe₂-atom.
32. (currently amended) The oxygen-resistant iron hydrogenase of claim 1 [[29]], wherein the one or more residues within the hydrogen channel of the oxygen-sensitive iron hydrogenase are independently substituted with leucine and/or isoleucine that projects into the hydrogen channel.
33. (currently amended) The oxygen-resistant iron hydrogenase of claim 1 [[29]], wherein the one or more residues within the hydrogen channel of the oxygen-sensitive iron hydrogenase are independently substituted with at least one hydrophobic residue and wherein the hydrophobic residue adds bulk to the hydrophobic surface of the channel.
34. (currently amended) The oxygen-resistant iron hydrogenase of claim 1 [[29]], wherein the one or more residues within the hydrogen channel of the oxygen-sensitive iron hydrogenase

are independently substituted with at least one bulky residue that narrows the channel opening at a protein surface-solvent boundary.

35. (currently amended) An oxygen-resistant iron hydrogenase derived from a ~~green algae~~ *Chlamydomonas reinhardtii* oxygen-sensitive iron hydrogenase comprising an hydrogen channel having a diameter defined by one or more identified diameter determining naturally occurring or synthetic amino acid residues selected from the group consisting of tryptophan, isoleucine, leucine, phenylalanine, and derivatives thereof, wherein the diffusion of oxygen within the channel is reduced as compared to the diffusion of oxygen in the hydrogen channel of the oxygen-sensitive iron hydrogenase.

36. (previously presented) The oxygen-resistant iron hydrogenase of claim 35, wherein one or more residues that line the hydrogen channel of the oxygen-sensitive iron hydrogenase are independently replaced with bulky and/or hydrophobic residues.

37. (previously presented) The oxygen-resistant iron hydrogenase of claim 35, wherein one or more residues that line the hydrogen channel of the oxygen-sensitive iron hydrogenase are independently replaced with tryptophan, isoleucine, leucine, or phenylalanine.

38. (previously presented) The oxygen-resistant iron hydrogenase of claim 35, wherein one or more residues that line the hydrogen channel of the oxygen-sensitive iron hydrogenase are independently replaced with a synthetic and/or derivatized amino acid having properties that limit O₂ diffusion through the channel while allowing H₂ diffusion out of the channel.

39. (previously presented) The oxygen-resistant iron hydrogenase of claim 35, wherein one or more residues that line the hydrogen channel of the oxygen-sensitive iron hydrogenase are independently replaced with a residue that has a side chain volume larger than the side chain volume of the amino acid at the same position in the oxygen-sensitive iron hydrogenase.

40. (currently amended) An oxygen-resistant iron hydrogenase derived from a ~~green algae~~ *Chlamydomonas reinhardtii* oxygen-sensitive iron hydrogenase, wherein one or more identified amino acid residues within an hydrogen channel in the oxygen-sensitive iron hydrogenase are substituted to reduce the oxygen sensitivity of the oxygen-resistant iron hydrogenase, wherein the one or more identified amino acid residues are independently substituted with a naturally occurring or synthetic amino acid selected from the group consisting of tryptophan, isoleucine, leucine, phenylalanine, and derivatives thereof, the substituted amino acid having properties that

limit O₂ diffusion through the channel while allowing H₂ diffusion out of the channel, and wherein the substituted amino acid reduces the diameter of the channel.

41. (previously presented) The oxygen-resistant iron hydrogenase of claim 40, wherein the average channel size is between about 5.0 and about 2.4 Å in diameter.

42. (previously presented) The oxygen-resistant iron hydrogenase of claim 40, wherein the average channel size is between about 3.5 and about 2.4 Å in diameter.

43-44. (cancelled)

45. (previously presented) The oxygen-resistant iron hydrogenase of claim 40, wherein one or more residues that line the hydrogen channel of the oxygen-sensitive iron hydrogenase are independently substituted with a synthetic and/or derivatized amino acid having properties that limit O₂ diffusion through the channel while allowing H₂ diffusion out of the channel.